E 1.28: SOLAR/1043-79/05

SOLAR/1043-79/05

Monthly Performance Report

UNIV. OF FL ... U.S. DEPOSITORY
FEB 19 1980

HULLCO CONSTRUCTION

MAY 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

4254

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MONTHLY PERFORMANCE REPORT

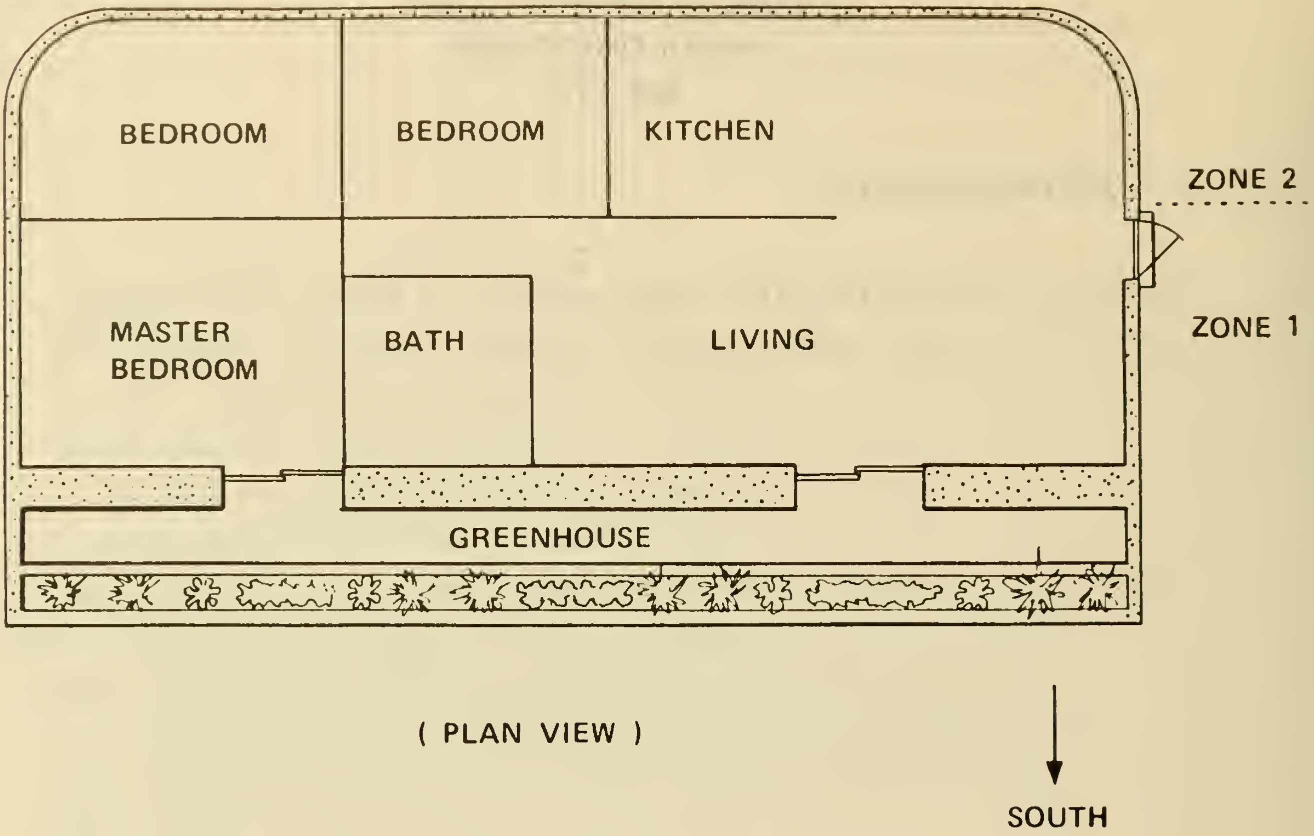
HULLCO CONSTRUCTION

MAY 1979

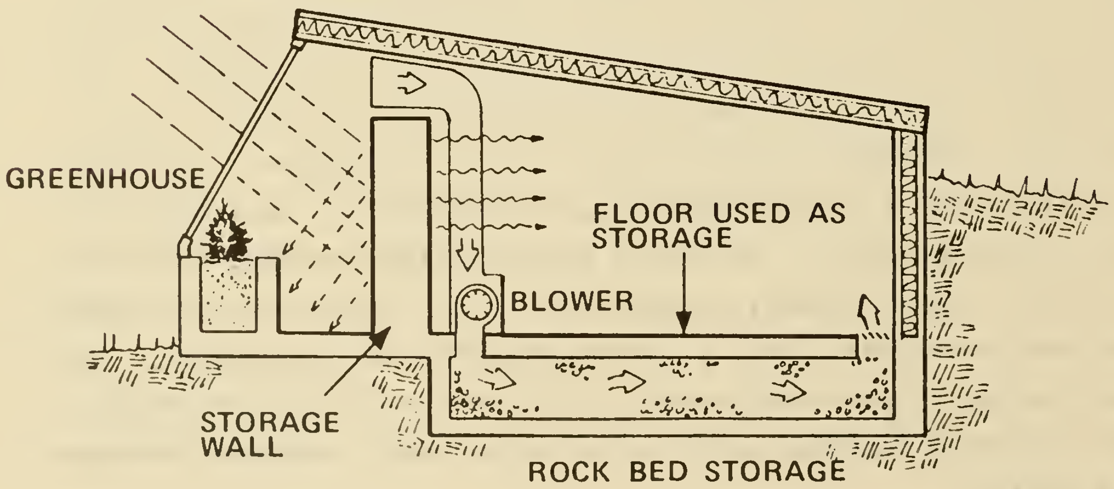
I. SYSTEM DESCRIPTION

The Hullco Construction solar energy system is a passive space heating system for a single family residence located in Prescott, Arizona. The south-facing building, illustrated in the drawings of Figure 1, is a combination greenhouse and direct gain passive system. Incident solar energy enters the building through approximately 400 square feet of double-glazed prefabricated Kalwall panels. Two sliding glass doors between the greenhouse and the house along with a window in the bathroom admit incident solar energy directly into the master bedroom, living room and bath areas of the house. Collected solar energy not used to satisfy the immediate building space heating demand is stored directly in the massive walls and floors of the building or indirectly in the 670 cubic feet of three to five inch diameter rock storage which is located under the floor of the north half of the building. Stored energy is released by low temperature radiation to satisfy the building space heating demand during periods of time when incident solar energy is not available.

Direct storage of collected solar energy is provided by the walls and floor of the building. The brick floor and the black painted north wall of the greenhouse provide solar energy storage for the greenhouse. The 12-inch thick, sand-filled concrete block greenhouse north wall acts as a Trombe wall, storing collected energy from the greenhouse during the day, and releasing the collected energy by radiation to the south part of the building at night. The 4-inch thick building concrete slab floor acts as direct solar storage, particularly in the living room and master bedroom areas where the floor is covered with Mexican tile masonry. Additional storage is provided by the 8-inch thick solid grouted concrete exterior insulated building walls on the north, east, and west perimeter of the building.



(PLAN VIEW)



(SECTION VIEW)

Figure 1. HULLCO CONSTRUCTION COMPANY SOLAR ENERGY SYSTEM SCHEMATIC

Indirect storage of collected solar energy is provided by the 670 cubic feet of rock storage located under the north side of the building and by the 4-inch thick carpeted concrete slab floor poured on top of the rock. Solar energy collected in the greenhouse is transferred to the rock bed from vents at the end of the greenhouse through under-floor ducts by two one-third horsepower blowers located at the east and west ends of the greenhouse. After transferring energy to the rocks, the air returns to the greenhouse through the house from floor vents located at the north side of the building. The greenhouse fans operate when temperatures near the top of the greenhouse reach approximately 90°F. Energy stored in the rock is released through the carpeted concrete floor to the house.

Summer overheating protection is provided by venting of the greenhouse and by both natural and artificial shading of the greenhouse glazing. Natural shading of the greenhouse is accomplished by the use of an existing tree to the southeast of the structure. However, the tree, a juniper tree, does shade the greenhouse some during mornings even during heating season. Additional greenhouse shading can be provided by a redwood snow fence placed over the glazing. Draperies covering the sliding glass doors on the north wall of the greenhouse can be closed to prevent incident sunlight from entering the building. Nighttime venting of the building can be used to cool the energy storage masses, thus cooling the building during the day as energy generated inside the building is absorbed by the walls and floor. Daytime venting of the greenhouse is accomplished using a thermostatically controlled powered fan, located at the top of the greenhouse, to draw air through the house and out the top of the greenhouse.

Low building heating loads are maintained by the use of good energy conservation construction techniques. The north, east, and west walls are insulated on the outside of the concrete blocks with two inches of styrafoam with a total wall R-value of 11. Nine inches of fiberglass batt insulation is used in the roof to yield a roof R-value of 32. The entire perimeter of the concrete slab floor is insulated. A minimum of

window area is used on the north, east and west walls. The building is bermed four feet into the earth on the north and west sides.

Auxiliary energy for space heating can be supplied by either electric radiant heat panels, or by the wood-burning stove. The wood-burning stove uses outside combustion air. The ceiling-mounted electric radiant heat panels, located in each room, are controlled by individual room thermostats.

The predicted annual solar contribution to the building load is 80 percent. Design monthly building heating loads for the entire area, including the greenhouse, are approximately 11,000 Btu per heating degree-day.

II. PERFORMANCE EVALUATION

A. Introduction

The month of May was a transition period from winter heating to summer overheat protection at the Hullco Construction site. Weather conditions were such that heating was required on some days while cooling would have been required on other days if overheating protection had not been adequate. However, a rather comfortable temperature environment was maintained inside the conditioned space. Overheating protection in the form of greenhouse shading and system venting was used to aid in moderation of potential temperature extremes while controlling interior relative humidity to acceptable values.

B. Weather

The daily average incident solar energy on the greenhouse glazing was 1,392 Btu/ft^2-day, which was slightly below the long-term average of 1,448 Btu/ft^2-day derived from measurements at the Phoenix, Arizona weather bureau. The average outside ambient temperature was 57°F,

slightly cooler than the long-term May average value for Prescott of 60°F. Daily average outside ambient temperatures varied considerably over the month from a low of 36°F on May 9 to a high of 66°F on May 23.

C. System Thermal Performance

The passive solar space heating system was operated in a warm weather mode over most of the month of May. The redwood snow fence was in place over the greenhouse glazing during the entire month. Venting of the house and greenhouse was also used to prevent overheating of the conditioned space. Only a small requirement existed for space heating. This occurred in the second week of May as outside ambient temperatures dropped to their lowest values of the month. During this time no use of auxiliary energy was required or used.

Since the system was operated in a warm weather mode, the performance analysis for May will address the warm weather operation concern for a passive system-potential conditioned space overheating. Temperatures inside the building were maintained at reasonably comfortable levels during the majority of the month. Late afternoon building temperatures occasionally reached values above 75°F. These higher temperatures were generally due to direct heating from the greenhouse as the sliding glass doors between the house and greenhouse areas were opened. Also contributing to the higher afternoon temperatures was energy admitted through the west facing window in the master bedroom when the window shade was open.

On most days, only small variations in building temperature were observed, even when considerable amounts of solar energy were available. The average difference in daily minimum and maximum building temperatures was only 4°F. Building temperatures dropped below 70°F only early in the morning as a result of nighttime venting and during the cool weather period during the second week of the month.

D. Observations

Several changes to the numbers in the attached computer printout are made for warm weather reporting of passive systems. The building is assumed to not have a heating load. Consequently the values of the heating load are set to zero. The performance factors relating to energy collection do not apply for the warm weather periods since the task for a passive system in warm weather is energy rejection as opposed to energy collection.

In past months a problem with high interior relative humidity has been encountered. Increases in interior relative humidity were found to correlate with operation of the greenhouse to rock bed fans. During May the fans were only occasionally used. However, considerable increases in interior relative humidity were observed on several days. These increases in interior relative humidity were found to correlate with periods of time when the sliding glass doors between the house and greenhouse were open. Consequently, it was concluded that the relative humidity problems previously encountered were due to excess moisture in the greenhouse area. This highly humid air enters the house either through the sliding glass door areas or via the rock bed when charging of the rock bed occurs. Effort is planned by the homeowner during the summer to alter the charging operation of the greenhouse fans so that return air will not pass through the house area, thus preventing the excess moisture from entering the house during the winter.

E. Energy Savings

An energy penalty of 1,000 Btu (0.3 kwh) of electrical energy was incurred due to incidental operation of the greenhouse to rock storage fans.

III. ACTION STATUS

One air flow sensor remains inoperative, but the missing data does not alter computed system performance. The instrumentation of the wood stove operation is being changed from a thermal switch to a stove surface temperature measurement in order to quantify both the heating rate of the wood stove and the effect of the stove on comfort.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

SITE/SYSTEM DESCRIPTION:
THE HULLCO SITE IS A PASSIVELY HEATED SINGLE FAMILY DWELLING WITH 1056 SQ. FT. OF FLOOR SPACE. THE STRUCTURAL ENVELOPE OPENS TO THE SOUTH WHERE A GREENHOUSE TRAPS HEAT. HEAT LOSSES FROM THE HOUSE ARE REDUCED BY USING HEAVY INSULATION IN THE CEILING AND REDUCING GLASS AREAS ON NORTH, EAST, AND WEST FACADES. ENERGY IS STORED IN THE CONCRETE FLOOR OF THE HOUSE AND THE MASSIVE INTERNAL WALLS. ADDITIONAL STORAGE IS PROVIDED BY TWO ROCK BEDS UNDER THE NORTH END OF THE BUILDING CHARGED BY FORCED AIR FROM THE GREENHOUSE.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	17.255	MILLION BTU
	43138	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	N.A.	MILLION BTU
	N.A.	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	57	DEGREES F
AVERAGE BUILDING TEMPERATURE	72	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.00	
ECSS OPERATING ENERGY	0.001	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.001	MILLION BTU
TOTAL ENERGY CONSUMED	0.007	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	N.A.	0.000	N.A.	0.000	MILLION BTU
SOLAR FRACTION	N.A.	0	N.A.	0	PERCENT
SOLAR ENERGY USED	N.A.	0.000	N.A.	0.000	MILLION BTU
OPERATING ENERGY	N.A.	N.A.	N.A.	0.001	MILLION BTU
AUX. THERMAL ENERGY	N.A.	0.003	N.A.	0.003	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	0.003	N.A.	0.003	MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
ELECTRICAL SAVINGS	N.A.	-0.001	N.A.	-0.001	MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.000

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

SITE/SYSTEM DESCRIPTION:
THE HULLCO SITE IS A PASSIVELY HEATED SINGLE FAMILY DWELLING WITH 1056 SQ. FT. OF FLOOR SPACE. THE STRUCTURAL ENVELOPE OPENS TO THE SOUTH WHERE A GREENHOUSE TRAPS HEAT. HEAT LOSSES FROM THE HOUSE ARE REDUCED BY USING HEAVY INSULATION IN THE CEILING AND REDUCING GLASS AREAS ON NORTH, EAST, AND WEST FACADES. ENERGY IS STORED IN THE CONCRETE FLOOR OF THE HOUSE AND THE MASSIVE INTERNAL WALLS. ADDITIONAL STORAGE IS PROVIDED BY TWO ROCK BEDS UNDER THE NORTH END OF THE BUILDING CHARGED BY FORCED AIR FROM THE GREENHOUSE.

GENERAL SITE DATA:		
INCIDENT SOLAR ENERGY	18.204	GIGA JOULES
	489573	KJ/SQ.M.
COLLECTED SOLAR ENERGY	N.A.	GIGA JOULES
	N.A.	KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	14	DEGREES C
AVERAGE BUILDING TEMPERATURE	22	DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.00	
ECSS OPERATING ENERGY	0.001	GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.001	GIGA JOULES
TOTAL ENERGY CONSUMED	0.007	GIGA JOULES

SUBSYSTEM SUMMARY:	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	N.A.	0.000	N.A.	0.000	GIGA JOULES
SOLAR FRACTION	N.A.	0	N.A.	0	PERCENT
SOLAR ENERGY USED	N.A.	0.000	N.A.	0.000	GIGA JOULES
OPERATING ENERGY	N.A.	N.A.	N.A.	0.001	GIGA JOULES
AUX. THERMAL ENG	N.A.	0.003	N.A.	0.003	GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	0.003	N.A.	0.003	GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	GIGA JOULES
ELECTRICAL SAVINGS	N.A.	-0.001	N.A.	-0.001	GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.000

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	NOT APPLICABLE	0.000	0.000	NOT APPLICABLE	-0.001	NOT APPLICABLE	73	54
2	0.000	0	0.000		0.000	0.000		0.000		71	49
3	0.000	0	0.000		0.000	0.000		0.000		70	55
4	0.000	0	0.000		0.000	0.000		0.000		71	56
5	0.000	0	0.000		0.000	0.000		0.000		72	62
6	0.000	0	0.000		0.000	0.000		0.000		71	63
7	0.000	0	0.000		0.000	0.000		0.000		71	57
8	0.000	0	0.000		0.000	0.000		0.000		68	42
9	0.000	0	0.000		0.000	0.000		0.000		66	36
10	0.000	0	0.000		0.000	0.000		0.000		68	44
11	0.000	0	0.000		0.000	0.000		0.000		70	50
12	0.000	0	0.000		0.000	0.000		0.000		71	56
13	0.000	0	0.000		0.000	0.000		0.000		72	58
14	0.000	0	0.000		0.000	0.000		0.000		74	63
15	0.000	0	0.000		0.000	0.000		0.000		73	62
16	0.000	0	0.000		0.000	0.000		0.000		73	60
17	0.000	0	0.000		0.000	0.000		0.000		73	62
18	0.000	0	0.000		0.000	0.000		0.000		74	62
19	0.000	0	0.000		0.001	0.001		0.000		73	56
20	0.000	0	0.000		0.000	0.000		0.000		71	48
21	0.000	0	0.000		0.000	0.000		0.000		73	59
22	0.000	0	0.000		0.000	0.000		0.000		75	65
23	0.000	0	0.000		0.000	0.000		0.000		75	66
24	0.000	0	0.000		0.002	0.002		0.000		74	58
25	0.000	0	0.000		0.000	0.000		0.000		72	57
26	0.000	0	0.000		0.000	0.000		0.000		72	55
27	0.000	0	0.000		0.000	0.000		0.000		72	59
28	0.000	0	0.000		0.000	0.000		0.000		72	62
29	0.000	0	0.000		0.000	0.000		0.000		73	63
30	0.000	0	0.000		0.000	0.000		0.000		73	62
31	0.000	0	0.000		0.000	0.000		0.000		73	63
SUM	0.000	-	0.000	N.A.	0.003	0.003	N.A.	-0.001	N.A.	-	-
AVG	0.000	0	0.000	N.A.	0.000	0.000	N.A.	-0.000	N.A.	72	57
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1442	N	54	64	34	275	5
2	1507	O	49	58	42	239	4
3	1126	T	55	61	41	196	2
4	1836		56	71	44	0	2
5	1899	A	62	76	25	259	6
6	1872	P	63	71	11	265	8
7	1877	P	57	64	26	259	11
8	603	L	42	44	72	237	9
9	500	I	36	42	88	220	2
10	1693	C	44	55	52	156	3
11	1836	A	50	63	41	114	3
12	1858	B	56	69	19	60	4
13	1850	L	58	77	19	0	2
14	1480	E	63	82	19	263	2
15	1447		62	76	19	262	4
16	1650		60	77	21	267	3
17	1738		62	75	27	*	2
18	1438		62	76	38	277	2
19	849		56	65	79	264	2
20	363		48	47	99	0	1
21	1792		59	70	70	174	2
22	1583		65	81	59	0	2
23	1365		66	82	48	246	3
24	525		58	65	77	*	3
25	802		57	59	71	46	2
26	670		55	60	90	0	1
27	908		59	65	73	0	2
28	1699		62	72	54	285	5
29	1713		63	74	39	284	5
30	1708		62	76	43	273	4
31	1515		63	76	35	277	3
SUM	43138	N.A.	-	-	-	-	-
AVG	1392	N.A.	57	68	48	264	4
NBS ID	0001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
PASSIVE SPACE HEATING

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

DAY OF MON	SPACE HEATING LOAD MILLION BTU	SOLAR ENERGY USED MILLION BTU	CHANGE IN STORE ENERGY MILLION BTU	AVERAGE STORAGE TEMP DEG F	DIRECT SOLAR UTIL EFFIC	AUX THERMAL USED MILLION BTU	BLDG TEMP DEG F	AMB TEMP DEG F	WIND AVG SPEED MPH	WIND AVG DIR DEG	SOLAR FR LOAD PER CENT
1	0.000	0.000	-0.028	71.4	0.000	0.000	73	54	5.0	275	0
2	0.000	0.000	-0.087	70.0	0.000	0.000	71	49	4.3	239	0
3	0.000	0.000	-0.047	68.9	0.000	0.000	70	55	2.3	196	0
4	0.000	0.000	0.040	69.3	0.000	0.000	71	56	1.6	0	0
5	0.000	0.000	-0.010	69.9	0.000	0.000	72	62	5.9	259	0
6	0.000	0.000	-0.081	69.2	0.000	0.000	71	63	8.1	265	0
7	0.000	0.000	-0.033	68.3	0.000	0.000	71	57	10.6	259	0
8	0.000	0.000	-0.139	66.1	0.000	0.000	68	42	9.5	237	0
9	0.000	0.000	-0.069	64.2	0.000	0.000	66	36	2.3	220	0
10	0.000	0.000	0.105	64.9	0.000	0.000	68	44	2.5	156	0
11	0.000	0.000	0.059	66.5	0.000	0.000	70	50	2.8	114	0
12	0.000	0.000	-0.026	67.5	0.000	0.000	71	56	4.2	60	0
13	0.000	0.000	0.023	67.5	0.000	0.000	72	58	2.0	0	0
14	0.000	0.000	0.007	67.7	0.000	0.000	74	63	2.2	263	0
15	0.000	0.000	0.013	68.0	0.000	0.000	73	62	3.7	262	0
16	0.000	0.000	0.013	67.9	0.000	0.000	73	60	3.2	267	0
17	0.000	0.000	0.036	68.4	0.000	0.000	73	62	2.1	*	0
18	0.000	0.000	0.022	69.0	0.000	0.000	74	62	2.2	277	0
19	0.000	0.000	-0.036	68.5	0.000	0.000	73	56	2.4	264	0
20	0.000	0.000	-0.061	67.1	0.000	0.000	71	48	1.3	0	0
21	0.000	0.000	0.077	67.4	0.000	0.000	73	59	2.4	174	0
22	0.000	0.000	0.041	68.3	0.000	0.000	75	65	1.5	0	0
23	0.000	0.000	0.020	69.4	0.000	0.000	75	66	3.3	246	0
24	0.000	0.000	-0.047	68.9	0.000	0.001	74	58	3.3	*	0
25	0.000	0.000	-0.035	67.7	0.000	0.000	72	57	2.4	46	0
26	0.000	0.000	-0.018	67.6	0.000	0.000	72	55	1.3	0	0
27	0.000	0.000	0.008	67.6	0.000	0.000	72	59	1.9	0	0
28	0.000	0.000	0.035	67.9	0.000	0.000	72	62	5.2	285	0
29	0.000	0.000	0.007	68.2	0.000	0.000	73	63	4.0	284	0
30	0.000	0.000	0.010	68.2	0.000	0.000	73	62	3.8	273	0
31	0.000	0.000	0.016	68.3	0.000	0.000	73	63	2.8	277	0
SUM	0.000	0.000	-0.183	-	-	0.003	-	-	-	-	-
AVG	0.000	0.000	-0.005	68.1	0.000	0.000	72	57	3.6	264	0
NBS	Q402	Q400	Q202			Q401	N405	N113	N114	N115	N400

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
PASSIVE SYSTEM ENVIRONMENT

SITE: HULLCO
REPORT PERIOD: MAY,1979

SOLAR/1043-79/05

DAY OF MON	BUILDING COMFORT ZONE 1	BLDG COMF ZONE 2	BUILDING TEMP MIDNIGHT DEG F	BUILDING TEMP 6 AM DEG F	BUILDING TEMP NOON DEG F	BUILDING TEMP 6 PM DEG F	INTERIOR RELATIVE HUMIDITY PERCENT	AMB TEMP DEG F	DAYTIME AMB TEMP DEG F	INCIDENT SOLAR ENERGY MILLION BTU	AVG STOR TEMP DEG F
1	74	71	73	72	72	74	55	54	64	0.577	71
2	73	69	74	71	71	71	49	49	58	0.603	70
3	72	69	71	70	69	71	48	55	61	0.451	69
4	72	70	71	69	72	73	47	56	71	0.734	69
5	73	70	72	70	72	73	38	62	76	0.756	70
6	72	70	73	71	70	72	29	63	71	0.749	69
7	72	69	71	70	70	72	32	57	64	0.751	68
8	70	67	71	69	68	68	37	42	44	0.241	66
9	68	65	67	66	66	65	41	36	42	0.200	64
10	69	67	68	66	68	71	48	44	55	0.677	65
11	71	68	69	66	70	74	56	50	63	0.734	66
12	72	69	70	68	71	77	54	56	68	0.743	68
13	73	70	72	69	72	75	44	58	77	0.740	68
14	73	72	72	70	73	79	30	63	82	0.592	68
15	73	72	74	72	73	74	27	62	76	0.579	69
16	73	71	73	71	72	74	26	60	77	0.660	68
17	73	72	73	71	72	75	27	62	75	0.695	68
18	74	73	74	72	74	75	33	62	76	0.575	69
19	73	72	74	73	73	74	36	56	65	0.340	69
20	72	70	73	71	71	72	40	48	47	0.145	67
21	73	72	70	69	71	78	44	59	70	0.717	67
22	74	74	75	72	74	76	38	65	81	0.633	69
23	74	74	76	74	76	76	34	66	82	0.546	69
24	74	73	75	74	74	75	37	58	65	0.210	69
25	72	70	73	72	68	73	43	57	59	0.321	68
26	72	70	73	71	71	72	47	55	60	0.268	68
27	72	70	72	70	72	73	44	59	65	0.363	68
28	72	71	73	71	71	77	39	62	72	0.680	68
29	72	71	73	71	72	73	35	63	74	0.685	68
30	72	72	73	71	72	74	30	62	76	0.683	68
31	72	72	73	71	72	75	28	63	76	0.606	68
SUM	-	-	-	-	-	-	-	-	-	17.255	-
AVG	72	71	72	71	71	74	39	57	63	0.557	68
NBS								N113			

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

4254

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HULLCO SITE SPECIAL REPORT

SITE: HULLCO
SOLAR/1043-79/05
REPORT PERIOD: MAY,1979

DAY OF MON	STORAGE AVG TEMP DEG F	ROCK STOR AVG TEMP DEG F	TROMBE WALL AVG TEMP DEG F	DIRECT GAIN FLOOR AVG TEMP DEG F
1	71	69	75	72
2	70	68	72	71
3	69	68	71	70
4	69	67	73	71
5	70	67	74	71
6	69	66	73	71
7	68	65	72	71
8	66	64	67	69
9	64	64	64	67
10	65	64	66	67
11	66	64	69	68
12	68	65	71	69
13	68	63	72	70
14	68	63	72	70
15	68	64	73	70
16	68	64	72	70
17	69	64	73	70
18	69	65	74	70
19	69	65	72	70
20	67	65	69	69
21	67	65	70	69
22	69	65	73	70
23	69	66	74	70
24	69	66	72	70
25	68	66	70	69
26	68	65	70	69
27	68	66	70	69
28	68	66	71	69
29	68	66	71	69
30	68	66	71	69
31	68	67	71	69
SUM	-	-	-	-
AVG	68	65	71	70
NBS				

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

☆U S GOVERNMENT PRINTING OFFICE 1979—640-189/4254

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